**TITLE 327 WATER POLLUTION CONTROL BOARD**

**Proposed Rule**
LSA Document #07-185

DIGEST

Amends 327 IAC 2-1-6 concerning amendments to the sulfate criterion. Effective 30 days after filing with the Publisher.

**HISTORY**

First Notice of Comment Period: March 28, 2007, Indiana Register (DIN: 20070328-IR-327070185FNA).

Second Notice of Comment Period: November 14, 2007, Indiana Register (DIN: 20071114-IR-327070185SNA).

Notice of Public Hearing: November 14, 2007, Indiana Register (DIN: 20071114-IR-327070185PHA).

Date of First Hearing: January 9, 2008.

**PUBLIC COMMENTS UNDER IC 13-14-9-4.5**

IC 13-14-9-4.5 states that a board may not adopt a rule under IC 13-14-9 that is substantively different from the draft rule published under IC 13-14-9-4 until the board has conducted a third comment period that is at least 21 days long.

**REQUEST FOR PUBLIC COMMENTS**

This proposed (preliminarily adopted) rule is not substantively different from the draft rule posted on November 14, 2007, at DIN: 20071114-IR-327070185SNA; however, the Indiana Department of Environmental Management (IDEM) is requesting comment on 327 IAC 2-1-6(a)(5), specifically on the wording of 327 IAC 2-1-6(a)(5)(B)(i), which is the only wording that has changed since the draft rule was posted in the Indiana Register at second notice of comment period. This notice requests the submission of comments only on 327 IAC 2-1-6(a)(5)(B)(i), including suggestions for specific amendments. These comments and the department's responses thereto will be presented to the board for its consideration at final adoption under IC 13-14-9-6. Mailed comments should be addressed to:

LSA Document #07-185 [Sulfate Revisions]
MaryAnn Stevens
Rules Section
Office of Water Quality
Indiana Department of Environmental Management
Indiana Government Center-North
100 North Senate Avenue
MC 65-40
Indianapolis, Indiana 46204-2251.

Hand delivered comments will be accepted by the IDEM receptionist on duty at the twelfth floor reception desk, Office of Water Quality, Indiana Government Center-North, 100 North Senate Avenue, Room N1255, Indianapolis, Indiana. Comments may be delivered by facsimile to (317) 232-8406. Please confirm the timely receipt of faxed comments by calling the Office of Water Quality Rules Section at (317) 233-8903. Please note it is not necessary to follow a faxed comment letter with another sent through the postal system.

**COMMENT PERIOD DEADLINE**

Comments must be postmarked, hand delivered, or faxed by February 20, 2008.

**SUMMARY/RESPONSE TO COMMENTS FROM THE SECOND COMMENT PERIOD**

IDEM requested public comment from November 14, 2007, through December 14, 2007, on IDEM's draft rule language. IDEM received a comment letter from the following party by the comment period deadline:

Indiana Water Quality Coalition and Indiana Manufacturers Association represented by Patrick Bennett (IWQC-IMA)

Following is a summary of the comment received and IDEM's responses thereto:

*Comment:* The Indiana Water Quality Coalition and the Indiana Manufacturers Association support the concepts embodied in the draft rule and appreciate the thoughtful response to comments given by IDEM during first notice. (IWQC-IMA)

*Response:* IDEM appreciates the supportive comment.

**SUMMARY/RESPONSE TO COMMENTS RECEIVED AT THE FIRST PUBLIC HEARING**

On January 9, 2008, the Water Pollution Control Board conducted the first public hearing/board meeting concerning sulfate criterion revisions to 327 IAC 2-1-6. No comments were made at the first hearing.

**327 IAC 2-1-6**

SECTION 1. 327 IAC 2-1-6, PROPOSED TO BE AMENDED AT 20070912-IR-327060573PRA, SECTION 1, IS AMENDED TO READ AS FOLLOWS:

**327 IAC 2-1-6 Minimum surface water quality standards**

**Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3**
**Affected: IC 13-11-2-258; IC 13-18-4; IC 13-30-2-1; IC 14-22-9**

Sec. 6. (a) The following are minimum surface water quality conditions:
(1) All surface waters at all times and at all places, including waters within the mixing zone, shall meet the minimum conditions of being free from substances, materials, floating debris, oil, or scum attributable to municipal, industrial, agricultural, and other land use practices, or other discharges that do any of the following:
(A) Will settle to form putrescent or otherwise objectionable deposits.
(B) Are in amounts sufficient to be unsightly or deleterious.
(C) Produce:
(i) color;
(ii) visible oil sheen;
(iii) odor; or
(iv) other conditions;
in such degree as to create a nuisance.
(D) Are in concentrations or combinations that will cause or contribute to the growth of aquatic plants or algae to such degree as to:
(i) create a nuisance;
(ii) be unsightly; or
(iii) otherwise impair the designated uses.
(E) Are in amounts sufficient to be acutely toxic to, or to otherwise severely injure or kill, aquatic life, other animals, plants, or humans. To assure protection of aquatic life, concentrations of toxic substances shall not exceed the final acute value (FAV = 2 (AAC)) in the undiluted discharge or the acute aquatic criterion (AAC) outside the zone of initial dilution or, if applicable, the zone of discharge-induced mixing:
(i) for certain substances, an AAC is established and set forth in subdivision (3), Table 6-1 and subdivision (3), Table 6-2 (which table incorporates subdivision (4), Table 6-3);
(ii) for substances for which an AAC is not specified in subdivision (3), Table 6-1 or subdivision (3), Table 6-2, an AAC can be calculated by the commissioner using the procedures in section 8.2 of this rule; and
(iii) the AAC determined under item (i) or (ii) may be modified on a site-specific basis to reflect local conditions in accordance with section 8.9 of this rule.
This clause shall not apply to the chemical control of plants and animals when that control is performed in compliance with approval conditions specified by the Indiana department of natural resources as provided by IC 14-22-9.
(2) At all times, all surface waters outside of mixing zones shall be free of substances in concentrations that on the basis of available scientific data are believed to be sufficient to injure, be chronically toxic to, or be carcinogenic, mutagenic, or teratogenic to humans, animals, aquatic life, or plants. To assure protection against the adverse effects identified in this subdivision, the following requirements are established:
(A) A toxic substance or pollutant shall not be present in such waters in concentrations that exceed the most stringent of the following continuous criterion concentrations (CCCs):
(i) A chronic aquatic criterion (CAC) to protect aquatic life from chronic toxic effects.
(ii) A terrestrial life cycle safe concentration (TLSC) to protect terrestrial organisms from toxic effects that may result from the consumption of aquatic organisms or water from the waterbody.
(iii) A human life cycle safe concentration (HLSC) to protect human health from toxic effects that may result from the consumption of aquatic organisms or drinking water from the waterbody.
(iv) For carcinogenic substances, a criterion to protect human health from unacceptable cancer risk of greater than one (1) additional occurrence of cancer per one hundred thousand (100,000) population.
(B) For certain substances, one (1) or more of the CCCs identified in clause (A) are established and set forth in subdivision (3), Table 6-1 and subdivision (3), Table 6-2 (which table incorporates subdivision (4), Table 6-3).

(C) For substances for which one (1) or more of the CCCs identified in clause (A) are not specified in subdivision (3), Table 6-1 or subdivision (3), Table 6-2, such criterion or criteria may be calculated by the commissioner using the corresponding procedures prescribed by sections 8.3 through 8.6 of this rule.
(D) A CCC determined under clause (B) or (C) may be modified on a site-specific basis to reflect local conditions in accordance with section 8.9 of this rule.
(E) The CAC and TLSC for a substance apply in all surface waters outside a mixing zone for a discharge of that substance. Similarly, in waters where a public water system intake is not present or is unaffected by the discharge of a substance, the HLSC and the carcinogenic criterion for that substance based on consumption of organisms from the waterbody and only incidental ingestion of water shall apply to all surface waters outside the mixing zone for a discharge of that substance. In surface waters where a public water system intake is present, the HLSC and the carcinogenic criterion for a substance based on consumption of organisms and potable water from the waterbody shall apply at the point of the public water system intake.

(3) The following establishes surface water quality criteria for specific substances:

Table 6-1
Surface Water Quality Criteria for Specific Substances

| AAC (Maximum) | CCC | | |
|---|---|---|---|
| | Outside of Mixing Zone | | Point of Water Intake |
| Substances | Aquatic Life (CAC) (4-Day Average) | Human Health (30-Day Average) | Human Health (30-Day Average) |
| Metals (µg/l) | | | |
| (Total recoverable) | | | |
| Antimony | | 45,000 (T) | 146 (T) |
| Arsenic (III) | # | # | 0.175 (C) | 0.022 (C) |
| Barium | | | 1,000 (D) |
| Beryllium | | 1.17 (C) | 0.068 (C) |
| Cadmium | # | # | 10 (D) |
| Chromium (III) | # | # | 3,433,000 (T) | 170,000 (T) |
| Chromium (VI) | # | # | 50 (D) |
| Copper | # | # | |
| Lead | # | # | 50 (D) |
| Mercury$ | 2.4 | 0.012 | 0.15 (T) | 0.14 (T) |
| Nickel | # | # | 100 (T) | 13.4 (T) |
| Selenium | 130* | 35 | 10 (D) |
| Silver | # | | 50 (D) |
| Thallium | | 48 (T) | 13 (T) |
| Zinc | # | # | |
| Organics (µg/l) | | | |
| Acrolein | | 780 (T) | 320 (T) |
| Acrylonitrile | | 6.5 (C) | 0.58 (C) |
| Aldrin$ | 1.5* | 0.00079 (C) | 0.00074 (C) |
| Benzene | | 400 (C) | 6.6 (C) |
| Benzidine | | 0.0053 (C) | 0.0012 (C) |
| Carbon Tetrachloride | | 69.4 (C) | 4.0 (C) |
| Chlordane$ | 1.2* | 0.0043 | 0.0048 (C) | 0.0046 (C) |
| Chlorinated Benzenes | | | |
| Monochlorobenzene | | | 488 (T) |
| 1,2,4,5-Tetrachlorobenzene $ | | 48 (T) | 38 (T) |
| Pentachlorobenzene $ | | 85 (T) | 74 (T) |
| Hexachlorbenzene$ | | 0.0074 (C) | 0.0072 (C) |
| Chlorinated Ethanes | | | |
| 1,2-dichloroethane | | 2,430 (C) | 9.4 (C) |
| 1,1,1-trichloroethane | | 1,030,000 (T) | 18,400 (T) |
| 1,1,2-trichloroethane | | 418 (C) | 6.0 (C) |
| 1,1,2,2-tetrachloroethane | | 107 (C) | 1.7 (C) |
| Hexachloroethane | | 87.4 (C) | 19 (C) |

| | | | | |
|---|---|---|---|---|
| Chlorinated Phenols | | | | |
| 2,4,5-trichlorophenol | | | | 2,600 (T) |
| 2,4,6-trichlorophenol | | | 36 (C) | 12 (C) |
| Chloroalkyl Ethers | | | | |
| bis(2-chloroisopropyl) ether | | | 4,360 (T) | 34.7 (T) |
| bis(chloromethyl) ether | | | 0.018 (C) | 0.000038 (C) |
| bis(2-chloroethyl) ether | | | 13.6 (C) | 0.3 (C) |
| Chloroform | | | 157 (C) | 1.9 (C) |
| Chlorpyrifos | 0.083 | 0.041 | | |
| DDT$ | 0.55* | 0.0010 | 0.00024 (C) | 0.00024 (C) |
| Dichlorobenzenes | | | 2,600 (T) | 400 (T) |
| Dichlorobenzidine | | | 0.2 (C) | 0.1 (C) |
| 1,1-dichloroethylene | | | 18.5 (C) | 0.33 (C) |
| 2,4-dichlorophenol | | | | 3,090 (T) |
| Dichloropropenes | | | 14,100 (T) | 87 (T) |
| Dieldrin$ | 1.3* | 0.0019 | 0.00076 (C) | 0.00071 (C) |
| 2,4-dinitrotoluene | | | 91 (C) | 1.1 (C) |
| Dioxin (2,3,7,8-TCDD)$ | | | 0.0000001 (C) | 0.0000001 (C) |
| 1,2-diphenylhydrazine | | | 5.6 (C) | 0.422 (C) |
| Endosulfan | 0.11* | 0.056 | 159 (T) | 74 (T) |
| Endrin$ | 0.09* | 0.0023 | | 1.0 (D) |
| Ethylbenzene | | | 3,280 (T) | 1,400 (T) |
| Fluoranthene | | | 54 (T) | 42 (T) |
| Halomethanes | | | 157 (C) | 1.9 (C) |
| Heptachlor$ | 0.26* | 0.0038 | 0.0028 (C) | 0.0028 (C) |
| Hexachlorobutadiene$ | | | 500 (C) | 4.47 (C) |
| Hexachlorocyclohexane (HCH) | | | | |
| alpha HCH$ | | | 0.31 (C) | 0.09 (C) |
| beta HCH$ | | | 0.55 (C) | 0.16 (C) |
| gamma HCH (Lindane)$ | 1.0* | 0.080 | 0.63 (C) | 0.19 (C) |
| Technical HCH$ | | | 0.41 (C) | 0.12 (C) |
| Hexachlorocyclopentadiene | | | | 206 (T) |
| Isophorone | | | 520,000 (T) | 5,200 (T) |
| Nitrobenzene | | | | 19,800 (T) |
| Nitrophenols | | | | |
| 4,6-dinitro-o-cresol | | | 765 (T) | 13.4 (T) |
| Dinitrophenol | | | 14,300 (T) | 70 (T) |
| Nitrosamines | | | | |
| N-nitrosodiethylamine | | | 12.4 (C) | 0.008 (C) |
| N-nitrosodimethylamine | | | 160 (C) | 0.014 (C) |
| N-nitrosodibutylamine | | | 5.9 (C) | 0.064 (C) |
| N-nitrosodiphenylamine | | | 161 (C) | 49 (C) |
| N-nitrosopyrrolidine | | | 919 (C) | 0.16 (C) |
| Parathion | 0.065 | 0.013 | | |
| Pentachlorophenol | $e^{(1.005\ [pH]-4.830)}$ | $e^{(1.005\ [pH]-5.290)}$ | | 1,000 (T) |
| Phenol | | | | 3,500 (T) |
| Phthalate Esters | | | | |
| Dimethyl phthalate | | | 2,900,000 (T) | 313,000 (T) |
| Diethyl phthalate | | | 1,800,000 (T) | 350,000 (T) |
| Dibutyl phthalate | | | 154,000 (T) | 34,000 (T) |
| Di-2-ethylhexyl phthalate | | | 50,000 (T) | 15,000 (T) |
| Polychlorinated Biphenyls (PCBs)$ | | 0.014 | 0.00079 (C) | 0.00079 (C) |
| Carcinogenic Polynuclear Aromatic Hydrocarbons (PAHs) | | | 0.31 (C) | 0.028 (C) |
| Tetrachloroethylene | | | 88.5 (C) | 8 (C) |
| Toluene | | | 424,000 (T) | 14,300 (T) |

| | | | | |
|---|---|---|---|---|
| Toxaphene$ | 0.73 | 0.0002 | 0.0073 (C) | 0.0071 (C) |
| Trichloroethylene | | | 807 (C) | 27 (C) |
| Vinyl Chloride | | | 5,246 (C) | 20 (C) |
| Other Substances | | | | |
| Asbestos (fibers/liter) | | | | 300,000 (C) |
| ~~Chlorides~~ **Chloride** (mg/l) | 860 | 230 | | |
| Chlorine (Total Residual) (µg/l) | 19 | 11 | | |
| Chlorine[a] (mg/l) (intermittent, total residual) | | 0.2 | | |
| Cyanide (Free) (µg/l) | 22 | 5.2 | | |
| Cyanide (Total) (µg/l) | | | | 200 (D) |
| Nitrate-N + Nitrite-N (mg/l) | | | | 10 (D) |
| Nitrite-N (mg/l) | | | | 1.0 (D) |

Fluoride shall not exceed two (2.0) mg/l in all surface waters outside of the mixing zone except the Ohio River and Interstate Wabash River where it shall not exceed one (1.0) mg/l outside of the mixing zone.

~~Sulfates~~ **Sulfate** shall not exceed ~~one thousand (1,000) mg/l~~ **the criteria established in subdivision (5)** in all surface waters outside of the mixing zone.

#The AAC and CAC for this substance are established in Table 6-2.

*One-half (½) of the final acute value (FAV) as calculated by procedures developed by U.S. EPA in 1980. This value would correspond to acute aquatic values calculated using IDEM procedures or U.S. EPA procedures developed in 1985 in which the calculated FAV is divided by two (2) to reduce acute toxicity.

T derived from threshold toxicity.

C derived from nonthreshold cancer risk.

D derived from drinking water standards, equal to or less than threshold toxicity.

$This substance is a bioaccumulative chemical of concern.

[a]To be considered an intermittent discharge, total residual chlorine shall not be detected in the discharge for a period of more than forty (40) minutes in duration, and such periods shall be separated by at least five (5) hours.

Table 6-2
Surface Water Quality Criteria for Specific Substances

| Substances | AAC (Maximum) (µg/l) | AAC Conversion Factors | CAC (4-Day Average) (µg/l) | CAC Conversion Factors |
|---|---|---|---|---|
| Metals (dissolved)[1] | | | | |
| Arsenic (III) | WER[2](360) | 1.000 | WER[2](190) | 1.000 |
| Cadmium | $WER[2](e^{(1.128[\ln(\text{hardness})]-3.828)})$ | 1.136672-[(ln hardness)(0.041838)] | $WER[2](e^{(0.7852[\ln(\text{hardness})]-3.490)})$ | 1.101672-[(ln hardness)(0.041838)] |
| Chromium (III) | $WER[2](e^{(0.819[\ln(\text{hardness})]+3.688)})$ | 0.316 | $WER[2](e^{(0.8190[\ln(\text{hardness})]+1.561)})$ | 0.860 |
| Chromium (VI) | WER[2](16) | 0.982 | WER[2](11) | 0.962 |
| Copper | $WER[2](e^{(0.9422[\ln(\text{hardness})]-1.464)})$ | 0.960 | $WER^{[2]}(e^{(0.8545[\ln(\text{hardness})]-1.465)})$ | 0.960 |
| Lead | $WER[2](e^{(1.273[\ln(\text{hardness})]-1.460)})$ | 1.46203-[(ln hardness)(0.145712)] | $WER[2](e^{(1.273[\ln(\text{hardness})]-4.705)})$ | 1.46203-[(ln hardness)(0.145712)] |
| Nickel | $WER^{[2]}(e^{(0.8460[\ln(\text{hardness})]+3.3612)})$ | 0.998 | $WER^{[2]}(e^{(0.8460[\ln(\text{hardness})]+1.1645)})$ | 0.997 |
| Silver | $WER^{[2]}(e^{(1.72[\ln(\text{hardness})]-6.52)}/2^{[3]})$ | 0.85 | | |
| Zinc | $WER^{[2]}(e^{(0.8473[\ln(\text{hardness})]+0.8604)})$ | 0.978 | $WER^{[2]}(e^{(0.8473[\ln(\text{hardness})]+0.7614)})$ | 0.986 |

[1] The AAC and CAC columns of this table contain total recoverable metals criteria (numeric and hardness-based). The criterion for the dissolved metal is calculated by multiplying the appropriate conversion factor by the AAC or CAC. This dissolved AAC or CAC shall be rounded to two (2) significant digits, except when the criteria are used as intermediate values in a calculation, such as in the calculation of water quality-based effluent limitations (WQBELs).

[2] A value of one (1) shall be used for the water-effect ratio (WER) unless an alternate value is established under section 8.9 of this rule.

[3] One-half (½) of the FAV as calculated by procedures developed by U.S. EPA in 1980. This value would correspond to acute aquatic values calculated using IDEM procedures or U.S. EPA procedures developed in 1985 in which the calculated FAV is divided by two (2) to reduce acute toxicity.

(4) The following establishes dissolved AAC and CAC for certain metals at selected hardness values calculated from the equations and conversion factors in subdivision (3), Table 6-2 and using a value of one (1) for the WER:

Table 6-3

Metals Concentrations in Micrograms Per Liter; Hardness in Milligrams Per Liter $CaCO_3$ [1]

| | Arsenic (III) | | Cadmium | | Chromium (III) | | Chromium (VI) | | Copper | | Lead | | Nickel | | Silver | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hardness | AAC | CAC | AAC | CAC | AAC | CAC | AAC | CAC | AAC | CAC | AAC | CAC | AAC | CAC | AAC | CAC | AAC | CAC |
| 50 | 360 | 190 | 1.7 | 0.62 | 310 | 100 | 16 | 11 | 8.9 | 6.3 | 30 | 1.2 | 790 | 87 | 0.52 | – | 64 | 58 |
| 100 | 360 | 190 | 3.7 | 1.0 | 550 | 180 | 16 | 11 | 17 | 11 | 65 | 2.5 | 1400 | 160 | 1.7 | – | 110 | 100 |
| 150 | 360 | 190 | 5.7 | 1.4 | 760 | 250 | 16 | 11 | 25 | 16 | 100 | 3.9 | 2000 | 220 | 3.5 | – | 160 | 150 |
| 200 | 360 | 190 | 7.8 | 1.7 | 970 | 310 | 16 | 11 | 33 | 21 | 140 | 5.3 | 2500 | 280 | 5.7 | – | 210 | 190 |
| 250 | 360 | 190 | 10 | 2.0 | 1200 | 380 | 16 | 11 | 40 | 25 | 170 | 6.7 | 3100 | 340 | 8.3 | – | 250 | 230 |
| 300 | 360 | 190 | 12 | 2.3 | 1300 | 440 | 16 | 11 | 48 | 29 | 210 | 8.1 | 3600 | 400 | 11 | – | 290 | 270 |
| 350 | 360 | 190 | 14 | 2.6 | 1500 | 500 | 16 | 11 | 55 | 33 | 240 | 9.5 | 4100 | 450 | 15 | – | 330 | 300 |
| 400 | 360 | 190 | 17 | 2.9 | 1700 | 550 | 16 | 11 | 63 | 37 | 280 | 11 | 4600 | 510 | 19 | – | 370 | 340 |
| 450 | 360 | 190 | 19 | 3.1 | 1900 | 610 | 16 | 11 | 70 | 41 | 320 | 12 | 5100 | 560 | 23 | – | 410 | 370 |
| 500 | 360 | 190 | 21 | 3.4 | 2100 | 670 | 16 | 11 | 78 | 45 | 350 | 14 | 5500 | 610 | 27 | – | 450 | 410 |

[1] The dissolved metals criteria in this table have been rounded to two (2) significant digits in accordance with subdivision (3), Table 6-2. The equations and conversion factors in subdivision (3), Table 6-2 shall be used instead of the criteria in this table when dissolved metals criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs.

**(5) The following establishes surface water quality criteria for sulfate that shall not be exceeded in all surface waters outside of the mixing zone:**

**(A) The following provides surface water quality criteria for sulfate in mg/l for the specified ranges of hardness (in mg/l as $CaCO_3$) or chloride (in mg/l), or both:**

**(i) If the hardness concentration of surface waters is greater than or equal to one hundred (100) mg/l but less than or equal to five hundred (500) mg/l, and if the chloride concentration of surface waters is greater than or equal to five (5) mg/l but less than twenty-five (25) mg/l, then:**

$$C = [-57.478 + 5.79 \text{ (hardness)} + 54.163 \text{ (chloride)}] \times 0.65$$

**Where: C = sulfate criterion in mg/l.**

**(ii) If the hardness concentration of surface waters is greater than or equal to one hundred (100) mg/l but less than or equal to five hundred (500) mg/l, and if the chloride concentration of surface waters is greater than or equal to twenty-five (25) mg/l but less than or equal to five hundred (500) mg/l, then:**

$$C = [1276.7 + 5.508 \text{ (hardness)} - 1.457 \text{ (chloride)}] \times 0.65$$

**Where: C = sulfate criterion in mg/l.**

**(iii) If the hardness concentration of surface waters is less than one hundred (100) mg/l and the chloride concentration of surface waters is less than or equal to five hundred (500) mg/l, the sulfate criterion is five hundred (500) mg/l.**

**(iv) If the hardness concentration of surface waters is greater than five hundred (500) mg/l and the chloride concentration of surface waters is greater than or equal to five (5) mg/l, but less than or equal to five hundred (500) mg/l, the sulfate criterion shall be calculated using a hardness**

**concentration of five hundred (500) mg/l and the equation in item (i) or (ii) that applies to the chloride concentration.**

**(v) If the chloride concentration of surface waters is less than five (5) mg/l, the sulfate criterion is five hundred (500) mg/l.**

**(B) The following applies to the surface water quality criteria for sulfate provided in clause (A):**

**(i) Sulfate criteria may only be established based on a chloride concentration greater than the CAC of two hundred thirty (230) mg/l for chloride, as established under Table 6-1, where the CAC for chloride has been modified on a site-specific basis in accordance with either the variance provisions under section 8.8 of this rule or the site-specific criteria provisions under section 8.9 of this rule.**

**(ii) The surface water quality criteria for sulfate calculated from equations in clause (A) shall be rounded to the nearest whole numbers, except when the criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs.**

**(C) The following establishes surface water quality criteria for sulfate in mg/l at selected concentrations of hardness and chloride, with the understanding that the equations in clause (A) shall be used instead of the criteria in this clause when sulfate criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs:**

**Hardness (mg/l)**

| Chloride (mg/l) | <100 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 | >500 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| <5 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| 5 | 500 | 515 | 703 | 891 | 1,080 | 1,268 | 1,456 | 1,644 | 1,832 | 2,020 | 2,020 |
| 10 | 500 | 691 | 879 | 1,067 | 1,256 | 1,444 | 1,632 | 1,820 | 2,008 | 2,196 | 2,196 |
| 15 | 500 | 867 | 1,055 | 1,243 | 1,432 | 1,620 | 1,808 | 1,996 | 2,184 | 2,372 | 2,372 |
| 20 | 500 | 1,043 | 1,231 | 1,419 | 1,608 | 1,796 | 1,984 | 2,172 | 2,360 | 2,549 | 2,549 |
| 25 | 500 | 1,164 | 1,343 | 1,522 | 1,701 | 1,880 | 2,059 | 2,238 | 2,417 | 2,596 | 2,596 |
| 50 | 500 | 1,141 | 1,320 | 1,499 | 1,678 | 1,857 | 2,036 | 2,215 | 2,394 | 2,573 | 2,573 |
| 100 | 500 | 1,093 | 1,272 | 1,451 | 1,630 | 1,809 | 1,988 | 2,167 | 2,346 | 2,525 | 2,525 |
| 150 | 500 | 1,046 | 1,225 | 1,404 | 1,583 | 1,762 | 1,941 | 2,120 | 2,299 | 2,478 | 2,478 |
| 200 | 500 | 998 | 1,177 | 1,356 | 1,535 | 1,715 | 1,894 | 2,073 | 2,252 | 2,431 | 2,431 |
| 230 | 500 | 970 | 1,149 | 1,328 | 1,507 | 1,686 | 1,865 | 2,044 | 2,223 | 2,402 | 2,402 |

(b) This subsection establishes minimum surface water quality for aquatic life. In addition to subsection (a), subdivisions (1) through (5) are established to ensure conditions necessary for the maintenance of a well-balanced aquatic community. The following are applicable at any point in the waters outside of the mixing zone:

(1) There shall be no substances that:

(A) impart unpalatable flavor to food fish; or

(B) result in offensive odors in the vicinity of the water.

(2) No pH values below six (6.0) or above nine (9.0), except daily fluctuations that:

(A) exceed pH nine (9.0); and

(B) are correlated with photosynthetic activity;

shall be permitted.

(3) Concentrations of dissolved oxygen shall:

(A) average at least five (5.0) milligrams per liter per calendar day; and

(B) not be less than four (4.0) milligrams per liter at any time.

(4) The following are conditions for temperature:

(A) There shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.

(B) The normal daily and seasonal temperature fluctuations that existed before the addition of heat due to other than natural causes shall be maintained.

(C) The maximum temperature rise at any time or place above natural temperatures shall not exceed:

(i) five (5) degrees Fahrenheit (two and eight-tenths (2.8) degrees Celsius) in streams; and

(ii) three (3) degrees Fahrenheit (one and seven-tenths (1.7) degrees Celsius) in lakes and reservoirs.

(D) Water temperatures shall not exceed the maximum limits in the following table during more than one percent (1%) of the hours in the twelve (12) month period ending with any month. At no time shall the water temperature at such locations exceed the maximum limits in the following table by more than three (3) degrees Fahrenheit (one and seven-tenths (1.7) degrees Celsius):

Table 6-4

| | Ohio River Main Stem °F(°C) | Other Indiana Streams °F(°C) |
|---|---|---|
| January | 50 (10.0) | 50 (10.0) |
| February | 50 (10.0) | 50 (10.0) |
| March | 60 (15.6) | 60 (15.6) |
| April | 70 (21.1) | 70 (21.1) |
| May | 80 (26.7) | 80 (26.7) |
| June | 87 (30.6) | 90 (32.2) |
| July | 89 (31.7) | 90 (32.2) |
| August | 89 (31.7) | 90 (32.2) |
| September | 87 (30.7) | 90 (32.2) |
| October | 78 (25.6) | 78 (25.5) |
| November | 70 (21.1) | 70 (21.1) |
| December | 57 (14.0) | 57 (14.0) |

(5) The following criteria will be used to regulate ammonia:

(A) Except for waters covered in clause (B), at all times, all surface waters outside of mixing zones shall be free of substances in concentrations that, on the basis of available scientific data, are believed to be sufficient to:

(i) injure;

(ii) be chronically toxic to; or

(iii) be carcinogenic, mutagenic, or teratogenic to;

humans, animals, aquatic life, or plants.

(B) For those waters listed in subsection (c), the following ammonia criteria will apply outside the mixing zone:

Maximum Ammonia Concentrations

(Unionized Ammonia as N)[***]

(mg/l)

| | Temperature (°C) | | | | | | |
|---|---|---|---|---|---|---|---|
| pH | 0 | 5 | 10 | 15 | 20 | 25 | 30 |
| 6.5 | 0.0075 | 0.0106 | 0.0150 | 0.0211 | 0.0299 | 0.0299 | 0.0299 |
| 6.6 | 0.0092 | 0.0130 | 0.0183 | 0.0259 | 0.0365 | 0.0365 | 0.0365 |
| 6.7 | 0.0112 | 0.0158 | 0.0223 | 0.0315 | 0.0444 | 0.0444 | 0.0444 |
| 6.8 | 0.0135 | 0.0190 | 0.0269 | 0.0380 | 0.0536 | 0.0536 | 0.0536 |
| 6.9 | 0.0161 | 0.0228 | 0.0322 | 0.0454 | 0.0642 | 0.0642 | 0.0642 |
| 7.0 | 0.0191 | 0.0270 | 0.0381 | 0.0539 | 0.0761 | 0.0761 | 0.0761 |
| 7.1 | 0.0244 | 0.0316 | 0.0447 | 0.0631 | 0.0892 | 0.0892 | 0.0892 |
| 7.2 | 0.0260 | 0.0367 | 0.0518 | 0.0732 | 0.1034 | 0.1034 | 0.1034 |
| 7.3 | 0.0297 | 0.0420 | 0.0593 | 0.0837 | 0.1183 | 0.1183 | 0.1183 |
| 7.4 | 0.0336 | 0.0474 | 0.0669 | 0.0946 | 0.1336 | 0.1336 | 0.1336 |
| 7.5 | 0.0374 | 0.0528 | 0.0746 | 0.1054 | 0.1489 | 0.1489 | 0.1489 |
| 7.6 | 0.0411 | 0.0581 | 0.0821 | 0.1160 | 0.1638 | 0.1638 | 0.1638 |
| 7.7 | 0.0447 | 0.0631 | 0.0892 | 0.1260 | 0.1780 | 0.1780 | 0.1780 |
| 7.8 | 0.0480 | 0.0678 | 0.0958 | 0.1353 | 0.1911 | 0.1911 | 0.1911 |
| 7.9 | 0.0510 | 0.0720 | 0.1017 | 0.1437 | 0.2030 | 0.2030 | 0.2030 |
| 8.0 | 0.0536 | 0.0758 | 0.1070 | 0.1512 | 0.2135 | 0.2135 | 0.2135 |
| 8.1 | 0.0537 | 0.0758 | 0.1071 | 0.1513 | 0.2137 | 0.2137 | 0.2137 |
| 8.2 | 0.0537 | 0.0758 | 0.1071 | 0.1513 | 0.2137 | 0.2137 | 0.2137 |
| 8.3 | 0.0537 | 0.0758 | 0.1071 | 0.1513 | 0.2137 | 0.2137 | 0.2137 |
| 8.4 | 0.0537 | 0.0758 | 0.1071 | 0.1513 | 0.2137 | 0.2137 | 0.2137 |
| 8.5 | 0.0537 | 0.0758 | 0.1071 | 0.1513 | 0.2137 | 0.2137 | 0.2137 |
| 8.6 | 0.0537 | 0.0758 | 0.1071 | 0.1513 | 0.2137 | 0.2137 | 0.2137 |
| 8.7 | 0.0537 | 0.0758 | 0.1071 | 0.1513 | 0.2137 | 0.2137 | 0.2137 |
| 8.8 | 0.0537 | 0.0758 | 0.1071 | 0.1513 | 0.2137 | 0.2137 | 0.2137 |
| 8.9 | 0.0537 | 0.0758 | 0.1071 | 0.1513 | 0.2137 | 0.2137 | 0.2137 |
| 9.0 | 0.0537 | 0.0758 | 0.1071 | 0.1513 | 0.2137 | 0.2137 | 0.2137 |

[***]To calculate total ammonia, divide the number in the table by the value determined by: $1/(10^{pKa\ -pH} + 1)$.

Where: $pK_a$ = 0.09018 + (2729.92/(T + 273.2))
pH = pH of water
T = °C

24-Hour Average Ammonia Concentrations
(Unionized Ammonia as N)***
(mg/l)
Temperature (°C)

| pH | 0 | 5 | 10 | 15 | 20 | 25 | 30 |
|---|---|---|---|---|---|---|---|
| 6.5 | 0.0005 | 0.0008 | 0.0011 | 0.0015 | 0.0015 | 0.0015 | 0.0015 |
| 6.6 | 0.0007 | 0.0010 | 0.0014 | 0.0019 | 0.0019 | 0.0019 | 0.0019 |
| 6.7 | 0.0009 | 0.0012 | 0.0017 | 0.0024 | 0.0024 | 0.0024 | 0.0024 |
| 6.8 | 0.0011 | 0.0015 | 0.0022 | 0.0031 | 0.0031 | 0.0031 | 0.0031 |
| 6.9 | 0.0014 | 0.0019 | 0.0027 | 0.0038 | 0.0038 | 0.0038 | 0.0038 |
| 7.0 | 0.0017 | 0.0024 | 0.0034 | 0.0048 | 0.0048 | 0.0048 | 0.0048 |
| 7.1 | 0.0022 | 0.0031 | 0.0043 | 0.0061 | 0.0061 | 0.0061 | 0.0061 |
| 7.2 | 0.0027 | 0.0038 | 0.0054 | 0.0077 | 0.0077 | 0.0077 | 0.0077 |
| 7.3 | 0.0034 | 0.0048 | 0.0068 | 0.0097 | 0.0097 | 0.0097 | 0.0097 |
| 7.4 | 0.0043 | 0.0061 | 0.0086 | 0.0122 | 0.0122 | 0.0122 | 0.0122 |
| 7.5 | 0.0054 | 0.0077 | 0.0108 | 0.0153 | 0.0153 | 0.0153 | 0.0153 |
| 7.6 | 0.0068 | 0.0097 | 0.0136 | 0.0193 | 0.0193 | 0.0193 | 0.0193 |
| 7.7 | 0.0086 | 0.0122 | 0.0172 | 0.0242 | 0.0242 | 0.0242 | 0.0242 |
| 7.8 | 0.0092 | 0.0130 | 0.0184 | 0.0260 | 0.0260 | 0.0260 | 0.0260 |
| 7.9 | 0.0098 | 0.0138 | 0.0196 | 0.0276 | 0.0276 | 0.0276 | 0.0276 |
| 8.0 | 0.0103 | 0.0146 | 0.0206 | 0.0294 | 0.0294 | 0.0294 | 0.0294 |
| 8.1 | 0.0103 | 0.0146 | 0.0206 | 0.0294 | 0.0294 | 0.0294 | 0.0294 |
| 8.2 | 0.0103 | 0.0146 | 0.0206 | 0.0294 | 0.0294 | 0.0294 | 0.0294 |
| 8.3 | 0.0103 | 0.0146 | 0.0206 | 0.0294 | 0.0294 | 0.0294 | 0.0294 |
| 8.4 | 0.0103 | 0.0146 | 0.0206 | 0.0294 | 0.0294 | 0.0294 | 0.0294 |
| 8.5 | 0.0103 | 0.0146 | 0.0206 | 0.0294 | 0.0294 | 0.0294 | 0.0294 |
| 8.6 | 0.0103 | 0.0146 | 0.0206 | 0.0294 | 0.0294 | 0.0294 | 0.0294 |
| 8.7 | 0.0103 | 0.0146 | 0.0206 | 0.0294 | 0.0294 | 0.0294 | 0.0294 |
| 8.8 | 0.0103 | 0.0146 | 0.0206 | 0.0294 | 0.0294 | 0.0294 | 0.0294 |
| 8.9 | 0.0103 | 0.0146 | 0.0206 | 0.0294 | 0.0294 | 0.0294 | 0.0294 |
| 9.0 | 0.0103 | 0.0146 | 0.0206 | 0.0294 | 0.0294 | 0.0294 | 0.0294 |

***To calculate total ammonia, divide the number in the table by the value determined by: $1/(10^{pKa-pH} + 1)$.

Where: $pK_a$ = 0.09018 + (2729.92/(T + 273.2))
pH = pH of water
T = °C

(c) This subsection establishes surface water quality for cold-water fish. In addition to subsections (a) and (b), the following criteria are established to ensure conditions necessary for the maintenance of a well-balanced, cold-water fish community and are applicable at any point in the waters outside of the mixing zone:

(1) Waters:
(A) designated as salmonid waters; and
(B) that shall be protected for cold-water fish;
are those waters designated by the Indiana department of natural resources for put-and-take trout fishing.

(2) In the waters listed in subdivision (1), dissolved oxygen concentrations shall not be less than:
(A) six (6.0) milligrams per liter at any time; and
(B) seven (7.0) milligrams per liter in areas where spawning occurs during the spawning season and in areas used for imprinting during the time salmonids are being imprinted.

(3) In those waters listed in subdivision (1), the maximum temperature rise above natural shall not exceed two (2) degrees Fahrenheit (one and one-tenth (1.1) degrees Celsius) at any time or place and, unless due to natural causes, the temperature shall not exceed the following:

(A) Seventy (70) degrees Fahrenheit (twenty-one and one-tenth (21.1) degrees Celsius) at any time.
(B) Sixty-five (65) degrees Fahrenheit (eighteen and three-tenths (18.3) degrees Celsius) during spawning and imprinting periods.

(d) This subsection establishes bacteriological quality for recreational uses during the recreational season as follows:
(1) The recreational season is defined as the months of April through October, inclusive.
(2) In addition to subsection (a), the criteria in this subsection are to be used to do the following:
(A) Evaluate waters for full body contact recreational uses.
(B) Establish wastewater treatment requirements.
(C) Establish effluent limits during the recreational season.
(3) For full body contact recreational uses, E. coli bacteria shall not exceed the following:
(A) One hundred twenty-five (125) per one hundred (100) milliliters as a geometric mean based on not less than five (5) samples equally spaced over a thirty (30) day period.
(B) Two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period, **except that in cases where there are at least ten (10) samples at a given site, up to ten percent (10%) of the samples may exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters where the:**
**(i) E. coli exceedances are incidental and attributable solely to E. coli resulting from the discharge of treated wastewater from a wastewater treatment plant as defined at IC 13-11-2-258; and**
**(ii) criterion in clause (A) is met.**
**However, a single sample shall be used for making beach notification and closure decisions.**
If a geometric mean cannot be calculated because five (5) equally spaced samples are not available, then the criterion stated in clause (B) must be met.
(4) For demonstrating compliance with wastewater treatment requirements, sanitary wastewater dischargers shall ensure the following:
(A) The concentration of E. coli in the undiluted discharge does not exceed one hundred twenty-five (125) cfu or MPN per one hundred (100) milliliters as a geometric mean of the effluent samples taken in a calendar month.
(B) Not more than ten percent (10%) of all samples when not less than ten (10) samples are taken and analyzed for E. coli in a calendar month exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters as a daily maximum. Under this clause, the calculation of ten percent (10%) of the samples taken shall be limited to the lowest whole number result.
(5) Effluent limits to implement the criteria in subdivision (3) during the recreational season shall be established in NPDES permits by incorporating the following that are to be applied to the undiluted discharge:
(A) The concentration of E. coli in the undiluted discharge shall not exceed one hundred twenty-five (125) cfu or MPN per one hundred (100) milliliters as a geometric mean of the effluent samples taken in a calendar month.
(B) Not more than ten percent (10%) of all samples ~~when not less than ten (10) samples are taken and analyzed for E. coli~~ in a calendar month exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters as a daily maximum. Under this clause, the calculation of ten percent (10%) of the samples taken shall be limited to the lowest whole number result.

(e) This subsection establishes surface water quality for public water supply. In addition to subsections (a) and (d), the following criteria are established to protect the surface water quality at the point at which water is withdrawn for treatment for public supply:
(1) The coliform bacteria group shall not exceed the following:
(A) Five thousand (5,000) per one hundred (100) milliliters as a monthly average value (either MPN or MF count).
(B) Five thousand (5,000) per one hundred (100) milliliters in more than twenty percent (20%) of the samples examined during any month.
(C) Twenty thousand (20,000) per one hundred (100) milliliters in more than five percent (5%) of the samples examined during any month.
(2) Taste and odor producing substances, other than naturally occurring, shall not interfere with the production of a finished water by conventional treatment consisting of the following:
(A) Coagulation.
(B) Sedimentation.
(C) Filtration.
(D) Disinfection.
(3) The concentrations of either ~~chlorides~~ **chloride** or ~~sulfates~~ **sulfate** shall not exceed two hundred fifty (250)

milligrams per liter unless due to naturally occurring sources.
(4) The concentration of dissolved solids shall not exceed seven hundred fifty (750) milligrams per liter unless due to naturally occurring sources. A specific conductance of one thousand two hundred (1,200) micromhos per centimeter (at twenty-five (25) degrees Celsius) may be considered equivalent to a dissolved solids concentration of seven hundred fifty (750) milligrams per liter.
(5) Surface waters shall be considered acceptable for public water supply if radium-226 and strontium-90 are present in amounts not exceeding three (3) and ten (10) picocuries per liter, respectively. In the known absence of strontium-90 and alpha emitters, the water supply is acceptable when the gross beta concentrations do not exceed one thousand (1,000) picocuries per liter.
(6) Chemical constituents in the waters shall not be present in such levels as to prevent, after conventional treatment, meeting the drinking water standards contained in 327 IAC 8-2, due to other than natural causes.

(f) This subsection establishes surface water quality for industrial water supply. In addition to subsection (a), the criterion to ensure protection of water quality at the point at which water is withdrawn for use (either with or without treatment) for industrial cooling and processing is that, other than from naturally occurring sources, the dissolved solids shall not exceed seven hundred fifty (750) milligrams per liter at any time. A specific conductance of one thousand two hundred (1,200) micromhos per centimeter (at twenty-five (25) degrees Celsius) may be considered equivalent to a dissolved solids concentration of seven hundred fifty (750) milligrams per liter.

(g) This subsection establishes surface water quality for agricultural uses. The criteria to ensure water quality conditions necessary for agricultural use are the same as those in subsection (a).

(h) This subsection establishes surface water quality for limited uses. The quality of waters classified for limited uses under section 3(a)(5) of this rule shall, at a minimum, meet the following criteria:
(1) The criteria contained in subsection (a).
(2) The criteria contained in subsection (d).
(3) The criteria contained in subsection (f), where applicable.
(4) The waters must be aerobic at all times.
(5) Notwithstanding subdivisions (1) through (4), the quality of a limited use stream at the point where it becomes physically or chemically capable of supporting a higher use or at its interface with a higher use water segment shall meet the criteria that are applicable to the higher use water.

(i) This subsection establishes surface water quality for exceptional uses. Waters classified for exceptional uses warrant extraordinary protection. Unless criteria are otherwise specified on a case-by-case basis, the quality of all waters designated for exceptional use shall be maintained without degradation.

*(Water Pollution Control Board; 327 IAC 2-1-6; filed Sep 24, 1987, 3:00 p.m.: 11 IR 581; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1020; errata, 13 IR 1861; errata filed Jul 6, 1990, 5:00 p.m.: 13 IR 2003; filed Feb 26, 1993, 5:00 p.m.: 16 IR 1725; errata filed May 7, 1993, 4:00 p.m.: 16 IR 2189; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1348; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2047; errata filed Apr 6, 2006, 2:48 p.m.: 29 IR 2546; errata, 29 IR 3027)*

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